

REMARKS

In response to the Office Action dated May 31, 2002, claims 4, 5, 7, 8 and 10-15 are amended, claims 1-3, 6 and 9 are canceled. Claims 4, 5, 7, 8 and 10-15 are now active in this application. No new matter has been added.

REJECTION OF CLAIMS UNDER 35 U.S.C. § 102 AND § 103

Claim 1 stands rejected under 35 U.S.C. §102(e) as being anticipated by Wall et al. (U.S. Patent No. 6,224,682).

Claims 2-6 and 8 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Wall et al. (U.S. Patent No. 6,224,682).

The Examiner admits that Wall et al. do not describe heating the chamber prior to or during the introduction of the 2nd substrate, but contends that it is obvious that Wall is describing to process only one substrate as an example, where in a real manufacturing process, many substrates would be processed continuously, therefore it would have been obvious to one skilled in the art to keep heating the chamber after the nickel has been deposited in order to prepare the chamber for the next deposition of the nickel for the next substrate.

The rejection of claims 2 and 8 is respectfully traversed.

Claims 1, 7, 9, 10, 13 and 14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Gupta et al. (U.S. Patent No. 6,225,202) and Wolf et al. (Silicon Processing for VLSI Era).

Claims 11 and 12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Gupta et al. (U.S. Patent No. 6,225,202) and Wolf et al. (Silicon Processing for

VLSI Era) as applied to claim 9 above, and further in view of Chen et al. (Comparison of TiSi_2 , CoSi_2 , and NiSi for thin-film Silicon-on Insulator Applications).

Claim 15 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Gupta et al. (U.S. Patent No. 6,225,202) and Wolf et al. (Silicon Processing for VLSI Era) as applied to claim 9 above, and further in view of Kunishima et al. (U.S. Patent No. 5,162,263).

Claim 2-6 and 8 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Gupta et al. (U.S. Patent No. 6,225,202) and Wolf et al. (Silicon Processing for VLSI Era) as applied to claim 1 above, and further in view of admitted prior art.

The Examiner admits that Gupta et al. and Wolf et al. do not describe preheating the chamber, but asserts that page 2 (of the specification) teaches that it is well known to preheat the chamber including sputter chamber, to accelerate the removal of contaminants from the chamber. The Examiner admits also that Gupta et al. and Wolf et al. do not describe heating the chamber during the introduction of the 2nd substrate, but contends that in a real manufacturing process, many substrates would be processed continuously. Therefore, it would have been obvious to one skilled in the art to keep heating the chamber after the nickel has been deposited and the substrate is removed from the chamber in order to prepare the chamber for the next deposition of the nickel for the next substrate as this would save processing time.

The rejection of claims 2 and 8 is respectfully traversed.

As to the rejections of claims 2-6 and 8, the Examiner is relying upon mere opinion, not evidence, to establish what would have been obviousness.

The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention is always upon the Examiner. *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 223 USPQ 785 (Fed. Cir. 1984). In rejecting a claim under 35 U.S.C. §103, the Examiner must provide a factual basis to support the obviousness conclusion. *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967); *In re Lunsford*, 357 F.2d 385, 148 USPQ 721 (CCPA 1966); *In re Freed*, 425 F.2d 785, 165 USPQ 570 (CCPA 1970). Based upon the objective evidence of record, the Examiner is required to make the factual inquiries mandated by *Graham v. John Deere Co.*, 86 S.Ct. 684, 383 U.S. 117, 148 USPQ 459, 469 (1966). The Examiner is also required to explain how and why one having ordinary skill in the art would have been led to modify an applied reference and/or to combine applied references to arrive at the claimed invention. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1988).

While the Examiner contends that in a real manufacturing process, many substrates would be processed continuously, nothing in such statement presents any evidence that it would have been obvious to one skilled in the art to keep heating the chamber after the nickel has been deposited. Merely knowing to process substrates one (or group/batch) after the other does not establish any reason to continuing heating the chamber between the exiting of one substrate (or group/batch) and the entry of the next substrate (or group/batch). Certainly, it is quite conceivable that there is no heating of the chamber between the exiting of one substrate (or group/batch) and the entry of the next substrate (or group/batch).

It should be recognized that the fact that the prior art could be modified so as to result in the combination defined by the claims at bar would not have made the

modification obvious unless the prior art suggests the desirability of the modification. *In re Deminski*, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986).

Recognizing, after the fact, that such a modification would provide an improvement or advantage, without suggestion thereof by the prior art, rather than dictating a conclusion of obviousness, is an indication of improper application of hindsight considerations. Simplicity and hindsight are not proper criteria for resolving obviousness. *In re Warner*, 379 F.2d 1011, 154, USPQ 173 (CCPA 1967).

Page 2 of the present specification merely teaches preheating the chamber under vacuum for a period of time prior to sue in depositing materials onto a semiconductor substrate to remove contaminants from the chamber. Given the fact that the chamber needs to be under vacuum, it cannot be said that this is also a teaching of heating the chamber between the exiting of one substrate (or group/batch) and the entry of the next substrate (or group/batch) as there would be no vacuum at such time in the chamber.

Reliance upon mere opinion to reject claims is not objective evidence that claims 2 and 8, as a whole, are obvious within the meaning of 35 U.S.C. § 103. In addition, reliance by the Examiner on his opinion as a reason why one having ordinary skill in the art would have been led to continuously heat the chamber from prior to entry of the first substrate and also between the exiting of the first substrate (or group/batch) and the entry of the next substrate (or group/batch) to arrive at the claimed invention, is an example of improper hindsight reconstruction of the claimed invention which does not support a *prima facie* case of obviousness under 35 U.S.C. § 103.

Clearly, the only apparent motivation of record for the proposed modification of the applied prior art references to arrive at the invention recited in claims 2 and 8 is found in

Applicants' disclosure which, of course, may not properly be relied upon to support the ultimate legal conclusion of obviousness under 35 U.S.C. §103. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 227 1 USPQ2d 1593 (Fed. Cir.

Thus, the Examiner has not factually established the requisite prospective motivation to support a *prima facie* case of obviousness under 35 U.S.C. § 103. *In re Deuel*, 51 F.3d 1552, 34 USPQ2d 1210 (Fed. Cir. 1995); *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1988).

See also *In re Zurko*, 258 F.3d 1379, 59 USPQ2d 1693 (Fed. Cir. 2001) and *In re Lee*, ____ F.3d ____, 61 USPQ2d 1430 (Fed. Cir. 2002), decided January 18, 2002.

To expedite prosecution, claim 1-3, 6 and 9 are canceled and independent claim 8 is amended to delineate subject matter patentable over the applied prior art references. Claims 4, 5, 7 and 10-15 are amended for consistency with amended claim 8.

More specifically, amended claim 8 now recites:

A method of forming nickel layers in a deposition chamber on a plurality of substrates, the deposition chamber having at least one heating element the method comprising:

heating the deposition chamber with the at least one heating element prior to introduction of a first substrate;

introducing the first substrate to the deposition chamber while heating the deposition chamber with the at least one heating element

depositing a layer of nickel on the first substrate while heating the deposition chamber with the at least one heating element;

removing the first substrate from the deposition chamber while heating the deposition chamber with the at least one heating element;

introducing a second substrate to the deposition chamber while heating the deposition chamber with the at least one heating element; and

depositing a layer of nickel on the second substrate while heating the deposition chamber with the at least one heating element, wherein

the chamber is heated with the at least one heating element continuously between the removal of the first substrate and the introduction of the second substrate.

Thus, the deposition chamber is heated prior to introducing the first substrate, while the first substrate is introduced into the deposition chamber, during deposition of a layer of nickel on the first substrate, during removal of the first substrate from the deposition chamber and introduction of the second substrate, and during deposition of a layer of nickel on the second substrate. Such "continuous" heating is clearly supported by the description on page 9, lines 23-30 and is not disclosed or suggested by the applied prior art references. Consequently, the allowance of amended independent claim 8, and amended claims 4, 5, 7 and 10-15, depending from amended claim 8, is respectfully solicited.

CONCLUSION

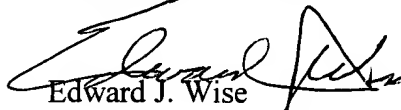
Accordingly, it is urged that the application, as now amended, is in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, Examiner is requested to call Applicants' attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this

paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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CLAIMS WITH MARKINGS TO SHOW CHANGES MADE

Please amend claims 4, 5, 7, 8 and 10-15

4. (Amended) The method according to claim 8, [1,] wherein the at least one heating element comprises a lamp.

5. Amended) The method according to claim 4, further comprising powering the at least one lamp from about 2 Amp to about 7 Amps during the introduction of [the substrate] both of the first and second substrates to the deposition chamber and during deposition of the nickel layer.

7. (Amended) The method according to claim 8, [1,] wherein [the] each substrate comprises silicon and the deposited nickel layer is heated to form a nickel silicide layer.

8. (Amended) A method of forming nickel layers in a deposition chamber on a plurality of substrates, the deposition chamber having at least one heating element the method comprising:

heating the deposition chamber with the at least one heating element prior to introduction of a first substrate;

introducing [a] the first substrate to [a] the deposition chamber while heating the deposition chamber with the at least one heating element; [, wherein the deposition chamber has at least one heating element for heating the deposition chamber and wherein the deposition chamber is heated prior to introducing the first substrate;]

depositing a layer of nickel on the first substrate while heating the deposition chamber with the at least one heating element;

removing the first substrate from the deposition chamber while heating the deposition chamber with the at least one heating element;

introducing a second substrate to the deposition chamber while heating the deposition chamber with the at least one heating element; and

depositing a layer of nickel on the second substrate while heating the deposition chamber with the at least one heating element, wherein; [and]

[heating] the chamber is heated with the at least one heating element continuously between the removal of the first substrate and the introduction of the second substrate.

10. (Amended) The method according to claim 8, further [9,] comprising cleaning [the semiconductor] each substrate prior to depositing the layer of nickel, [layer.]

11. (Amended) The method according to claim 8, wherein the layer of nickel is formed on exposed silicon surfaces of each substrate and the method further [9,] comprising:

heating the layer of nickel at a temperature of approximately 300 °C to approximately 550 °C to form [the] a nickel silicide layer, [on the gate electrode and source/drain regions at a temperature of approximately 300 °C to approximately 550 °C.]

12. (Amended) The method according to claim 11, wherein [9, comprising] the heating of the layer of nickel [semiconductor substrate] to form the nickel silicide layer [on the gate electrode and source/drain regions] is carried out for approximately 5 seconds to approximately 2 minute.

13. (Amended) The method according to claim 12, further [9,] comprising removing unreacted nickel by wet chemical etching.

14. (Amended) The method according to claim 13, wherein [9, comprising] the removing unreacted nickel is carried by immersing [the semiconductor] each substrate in a solution of NH_4OH , H_2O_2 and water or immersing [the semiconductor] each substrate in a solution of H_2SO_4 , H_2O_2 and water.

15. (Amended) The method according to claim 14, further [9,] comprising forming a conductive connection to the nickel silicide layers without using a cap layer.